The Effects of Symbiote Ostracods on Invasive Crayfish Behavior

Audrey Fontes[1], Elyse Vetter[1], Gary Bucciarelli[2], and Lee Kats[1]

[1]Pepperdine University, Natural Science Division, 24255 Pacific Coast Highway, Malibu, CA 90263
[2]UCLA Dept. of Ecology and Evolutionary Biology, 621 Charles E. Young Los Angeles, CA 90095

Abstract

Invasive crayfish, *Procambarus clarkii*, are known to negatively impact the biodiversity of Santa Monica Mountain streams. Small symbiotes, ostracods, live on *Procambarus clarkii* in some local streams. However, their effect on the behaviour of invasive crayfish is unknown. We used an aqueous chlorobutanol solution to remove ostracods from crayfish. We paired control crayfish with those that had ostracods removed and scored aggressive interactions. Crayfish without ostracods were found to be significantly more aggressive towards crayfish with ostracods. When we compared feeding behavior, we found that crayfish without ostracods consumed food more quickly than control crayfish. We again subjected crayfish to the ostracod removal process and confirmed that there were significantly fewer ostracods on the crayfish that had gone through the initial ostracod removal procedure. Given that the presence of ostracods seems to have moderated both aggressive and feeding behavior, we suggest that symbiote ostracods help reduce impacts of invasive crayfish on local streams.

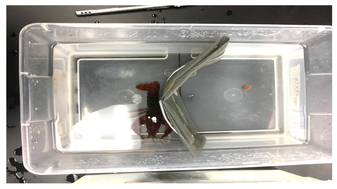
Introduction

- Crayfish, *Procambarus clarkii,* are an invasive species in the Santa Monica Mountains (Los Angeles, CA) and are known to be extremely aggressive and harmful to native species (Mestre, Alexandre, et al.)
- The crayfish have greatly reduced native species populations and contributed to changes in stream habitat (Sargent)
- Ostracods are small arthropods found on crayfish in some Santa Monica Mountain streams.
- Ostracods live on the gills and mouth area of crayfish.
- The ostracods effect on crayfish is unknown. It would be beneficial to understand if ostracods have any effect on the feeding and aggressive behavior of invasive crayfish.

Methods

- Crayfish were collected from Medea Creek in the Santa Monica Mountains during July 2018. Each crayfish was isolated.
- Initially, all crayfish contained ostracods. The experimental group underwent an ostracod removal treatment: submersion of each crayfish in 0.5% chlorobutanol solution for ten minutes every three days (Mestre, Alexandre, et al)
- A shrimp pellet was placed on one side of a mesh barrier, a crayfish on the other side within a container. When the mesh was removed, a 70 minute trial proceeded to record when and if food was completely consumed.
- An experimental group of crayfish was paired with a control group of crayfish of the same size and sex. Each placed in a container on opposite sides of a mesh barrier. Every ten seconds an aggression score was given to each crayfish.
- The inside of the container was altered to provide a substrate for ostracod movement and transfer during crayfish interaction.

Figure 1: Experimental Setup for Food Consumption Trails



Crayfish

Ostracod

Results

Figure 2: Crayfish without ostracods (experimental, 15) are more likely to consume food than crayfish with ostracods (control,12). Chi-Square test; Chi-Square= 6.97; Cramer's V= 0.5975;df= 1; p < 0.01.

	Consumed Food	Did Not Consume Food
Control Group	6	6
Experimental Group	15	0

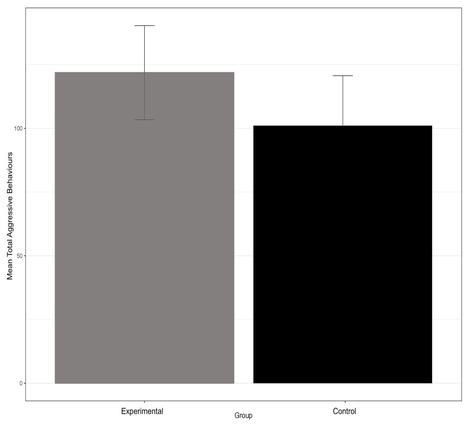


Figure 3: Crayfish without ostracods (experimental, mean=11) are significantly more aggressive than crayfish with ostracods (control, mean=11). Paired T test; T=3.5; df=10; P< 0.01.

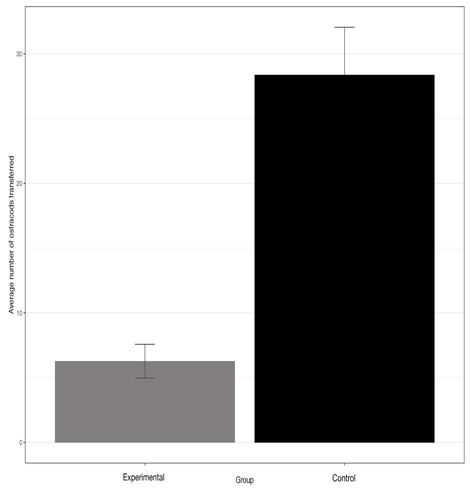


Figure 4: The number of ostracods on the control crayfish (mean =28.36) are significantly higher than the experimental crayfish (mean=6.27). Two Sample T Test;T=-5.6381; df=12.47;p < .001.

Discussion

- It is important to understand the effect of ostracods on crayfish to determine whether they have any effect on crayfish ability to invade ecosystems.
- Crayfish without ostracods are more likely to consume food than crayfish with ostracods. Streams with crayfish without ostracods could have lower biodiversity, prey population, and increased numbers of crayfish. Fig. 1 & 2
- Crayfish without ostracods are significantly more aggressive than crayfish with ostracods. Streams with crayfish without ostracods could have lower biodiversity, prey population, and increased rate of ecosystem invasion. Fig. 3
- Results indicate a significant difference in the number of ostracods on the control crayfish versus the experimental crayfish. Fig. 4
- The scoring scale used in the aggression trials ranged from 0-6. 0 being no aggression and 6 being the highest aggression.

Works Cited

Mestre, Alexandre, et al. "Comparison of Two Chemicals for Removing an Entocytherid (Ostracoda: Crustacea) Species from Its Host Crayfish (Cambaridae: Crustacea)." *International Review of Hydrobiology*, vol. 96, no. 4, 2011, pp. 347–355., doi:10.1002/iroh.201111343.
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